

WHAT IS CLAIMED IS:

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1. An image forming apparatus that forms a multi-color image by superposing a plurality of monochrome images, comprising:

10        a plurality of image forming units corresponding to respective colors, each of which forms said corresponding monochrome image;

      a plurality of pattern forming units corresponding to the respective colors, each of which forms a predetermined compensation pattern;

15        a plurality of pattern position detecting units corresponding to the respective colors, each of which detects the position of said compensation pattern formed by said pattern forming unit of the corresponding color; and

20        a plurality of image position adjusting units corresponding to the respective colors, each of which adjusts the position of said monochrome image to be formed by said image forming unit based on the position of said compensation pattern detected by

25        said pattern position detecting unit of the

corresponding color;

wherein said compensation pattern is formed under an image forming condition adjustable independently from an image forming condition with 5 which said monochrome image formed by said image forming unit of the corresponding color is formed.

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2. The image forming apparatus as claimed in claim 1, wherein

each of said plurality of image forming units further comprises:

15 one of a rotating and a moving image retaining unit on which a latent monochrome image is formed by scanning said image retaining unit with a light beam based on image data;

a development unit that makes said formed 20 latent monochrome image visible; and

one of a rotating and a moving transfer unit that transfers said visible monochrome image to a recording medium.

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3. The image forming apparatus as claimed in  
claim 2, wherein said image forming condition is  
adjusted by changing exposure energy of said light  
beam.

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4. The image forming apparatus as claimed in  
10 claim 3, wherein said exposure energy of said light  
beam is adjusted by changing light intensity of said  
light beam.

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5. The image forming apparatus as claimed in  
claim 3, wherein said exposure energy of said light  
beam is adjusted by changing time in which said light  
20 beam is radiated.

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6. The image forming apparatus as claimed in

claim 2, wherein said image forming condition is adjusted by changing bias voltage applied to said development unit.

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7. The image forming apparatus as claimed in claim 2, wherein said image forming condition is 10 adjusted by changing bias voltage applied to said transfer unit.

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8. The image forming apparatus as claimed in claim 2, wherein  
said development unit makes said formed  
latent monochrome image visible with toner; and  
20 said image forming condition is adjusted by  
changing amount of toner to be used to make said  
formed latent monochrome image visible.

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9. The image forming apparatus as claimed in  
claim 8, wherein if the amount of remaining toner is  
lower than a predetermined level, said amount of  
toner to be used to make said formed latent  
5 monochrome image visible is changed.

10 10. The image forming apparatus as claimed  
in claim 8, wherein if said amount of toner is  
changed, said toner is stirred before forming said  
latent monochrome image.

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11. The image forming apparatus as claimed  
in claim 2, wherein said image forming condition is  
20 adjusted by changing scan speed at which said light  
beam scans said image retaining unit.

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12. The image forming apparatus as claimed  
in claim 2, wherein said image forming condition is  
adjusted by changing one of moving speed and rotative  
speed of said image retaining unit.

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13. The image forming apparatus as claimed  
10 in claim 2, wherein said image forming condition is  
adjusted by changing at least two of exposure energy  
by said light beam, bias voltage of said development  
unit, bias voltage of said transfer unit, toner  
amount to be used for making said formed latent  
15 monochrome image visible, scan speed at which said  
light beam scans said image retaining unit, and one  
of moving speed and rotative speed of said image  
retaining unit.

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14. The image forming apparatus as claimed  
in claim 2, wherein  
25                   said image retaining unit coupled with at

least one of a charging unit that charges said image retaining unit, said development unit, and a cleaning unit that cleans said image retaining unit forms a detachable process cartridge.

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15. The image forming apparatus as claimed  
10 in claim 14, wherein

said process cartridge further comprises a memory unit that stores said image forming condition under which said compensation pattern is formed; and  
15 said process cartridge, when forming said compensation pattern, reads said image forming condition stored in said memory unit and forms said compensation pattern under the read image forming condition.

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16. The image forming apparatus as claimed  
in claim 15, wherein said image forming condition  
25 stored in said memory unit is rewritable.

17. The image forming apparatus as claimed  
in claim 16, wherein

5           said image forming condition with which said  
monochrome image is formed is stored in said memory  
unit; and

10           when said monochrome image is formed, said  
image forming condition with which said monochrome  
image is formed is read from said memory unit, and  
said monochrome image is formed under the read image  
10           forming condition.

15           18. The image forming apparatus as claimed  
in claim 17, wherein said image forming condition  
with which said monochrome image is formed stored in  
said memory unit is rewritable.

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25           19. The image forming apparatus as claimed  
in claim 14, wherein  
said process cartridge has a room in which

reserved toner is stored; and  
if image density of said compensation  
pattern is equal to or less than a predetermined  
density, said reserved toner stored in said room is  
5 provided to said development unit.

10 20. The image forming apparatus as claimed  
in claim 19, wherein  
said process cartridge provides said  
reserved toner to a portion of said developing unit  
that forms said compensation pattern.

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20 21. The image forming apparatus as claimed  
in claim 19, wherein  
amount of reserved toner provided to said  
portion of said developing unit is stored in said  
memory unit.

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22. The image forming apparatus as claimed  
in claim 19, wherein said process cartridge, before  
forming said compensation pattern, stirs said  
reserved toner to be provided to said development  
5 unit.

10 23. The image forming apparatus as claimed  
in claim 2, wherein  
said image retaining unit coupled with at  
least one of a charging unit that charges said image  
retaining unit and a cleaning unit that cleans said  
15 image retaining unit forms a detachable  
photosensitive body unit; and  
said development unit forms a detachable  
developing unit.

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24. The image forming apparatus as claimed  
in claim 23, wherein  
25 at least one of said photosensitive body

unit and said development unit has a memory unit to store an image forming condition to be used when said compensation pattern is formed; and

when said compensation pattern is formed,  
5 said image forming condition stored in said memory unit is read, and said compensation pattern is formed using said read image forming condition.

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25. The image forming apparatus as claimed in claim 24, wherein said image forming condition stored in said memory unit is rewritable.

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26. The image forming apparatus as claimed  
20 in claim 24, wherein  
said image forming condition of said monochrome image is stored in said memory unit; and  
when said monochrome image is formed, said image forming condition of said monochrome image is  
25 read from said memory unit, and said monochrome image

is formed using said image forming condition of said monochrome image.

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27. The image forming apparatus as claimed in claim 26, wherein said image forming condition of a monochrome image stored in said memory unit is  
10 rewritable.

15 28. The image forming apparatus as claimed in claim 23, wherein  
                  said development unit is provided with a  
                  space for storing reserved toner; and  
                  when image density of said formed  
20 compensation pattern is lower than a predetermined  
                  density, said reserved toner stored in said space can  
                  be supplied to said development unit.

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29. The image forming apparatus as claimed  
in claim 28, wherein said reserved toner is supplied  
to a portion of said development unit that forms said  
compensation pattern.

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30. The image forming apparatus as claimed  
10 in claim 28, wherein said development unit is  
provided with a memory for storing the supplied  
amount of said reserved toner.

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31. The image forming apparatus as claimed  
in claim 28, wherein said development unit stirs said  
reserved toner provided thereto before forming said  
20 compensation pattern.

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32. The image forming apparatus as claimed

in claim 2, further comprising a cleaning unit that cleans a position of said image retaining unit at which said compensation pattern is formed.

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33. The image forming apparatus as claimed in claim 2, wherein said compensation pattern of each 10 color is formed under said image forming condition for forming said monochrome image.

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34. A process cartridge that is used for an image forming apparatus of claim 2, comprising:  
said image retaining unit;  
at least one of a charging unit that charges 20 said image retaining unit, said development unit, and a cleaning unit that cleans said image retaining unit;  
a memory unit that stores said image forming condition to be used when said compensation pattern 25 is formed;

wherein said image retaining unit and at least one of said charging unit, said development unit, and said cleaning unit are combined and detachable from said image forming apparatus.

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35. The process cartridge as claimed in  
10 claim 34, wherein said image forming condition of  
said compensation pattern stored in said memory unit  
is rewritable.

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36. The process cartridge as claimed in  
claim 34, wherein said memory unit stores said image  
forming condition to be used when said monochrome  
20 image is formed.

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37. The process cartridge as claimed in

claim 36, wherein said image forming condition of said monochrome image stored in said memory unit is rewritable.

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38. The process cartridge as claimed in  
claim 34, further comprising a space in which  
10 reserved toner is stored;

wherein, when image density of said formed compensation pattern is lower than a predetermined density, said reserved toner stored in said space can be provided to said development unit.

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39. The process cartridge as claimed in  
20 claim 38, wherein said reserved toner is provided to a portion of said development unit that forms said compensation pattern.

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40. The process cartridge as claimed in  
claim 38, further comprising a memory unit that  
stores the supplied amount of said reserved toner.

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41. The process cartridge as claimed in  
claim 38, wherein said reserved toner supplied to  
10 said development unit is stirred before forming said  
compensation pattern.

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42. A photosensitive body unit used for the  
image forming apparatus of claim 2, wherein  
said photosensitive body unit is structured  
by said image retaining unit combined with at least  
20 one of a charging unit that charges said image  
retaining unit and a cleaning unit that cleans said  
image retaining unit; and  
said photosensitive body unit is provided  
with a memory unit that stores said image forming  
25 condition used when said compensation pattern is

formed.

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43. The photosensitive body unit as claimed in claim 42, wherein said image forming condition of said compensation pattern stored in said memory unit is rewritable.

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44. The photosensitive body unit as claimed in claim 42, wherein said memory unit stores said image forming condition used when said monochrome image is formed.

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45. The photosensitive body unit as claimed in claim 44, wherein said image forming condition of said monochrome image stored in said memory unit is rewritable.

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46. The photosensitive body unit as claimed in claim 42, further comprising a cleaning unit that cleans a position on said image retaining unit at which said compensation pattern is formed.

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47. A detachable development unit that is used for the image forming apparatus as claimed in claim 2, comprising a memory unit that stores said image forming condition to be used when said compensation pattern is formed.

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48. The development unit as claimed in claim 47, wherein said image forming condition of said compensation pattern stored in said memory unit is rewritable.

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49. The development unit as claimed in claim  
48, wherein said memory unit stores said image  
forming condition to be used when said monochrome  
image is formed.

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50. The development unit as claimed in claim  
10 49, wherein said image forming condition of said  
monochrome image stored in said memory unit is  
rewritable.

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51. The development unit as claimed in claim  
47, further comprising a space in which reserved  
toner is stored;  
20 wherein, if image density of said formed  
compensation pattern is less than a predetermined  
density, said reserved toner can be supplied to said  
development unit.

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52. The development unit as claimed in claim  
51, wherein said reserved toner is supplied to a  
portion of said development unit that forms said  
compensation pattern.

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53. The development unit as claimed in claim  
10 51, further comprising a memory unit that stores the  
supplied amount of said reserved toner.

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54. The development unit as claimed in claim  
51, wherein said reserved toner provided to said  
development unit is stirred before forming said  
compensation pattern.

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55. An image forming apparatus that forms a  
25 multi-color image by superposing at least two

monochrome images, comprising:

means for forming a plurality of monochrome images one provided for each color;

means for forming a plurality of 5 predetermined compensation patterns one provided for each color;

means for detecting positions of said formed compensation patterns provided for each color; and

means for adjusting positions of said 10 monochrome images to be formed based on the positions of said detected compensation patterns provided for each color;

wherein said compensation pattern is formed under an image forming condition adjustable 15 independently from another image forming condition under which said monochrome images are formed.

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56. The image forming apparatus as claimed in claim 55, wherein

said means for forming monochrome images further comprises:

25 means for retaining a latent monochrome

image formed by scanning said means for retaining a latent monochrome image with a light beam based on image data; said means for retaining a latent monochrome image rotating or moving;

5           means for developing said latent monochrome image formed on said means for retaining a latent monochrome image; and

              means for transferring said developed monochrome image to a recording medium that is  
10           rotating or moving.

15           57. The image forming apparatus as claimed in claim 56, wherein said image forming condition is adjusted by changing exposure energy of said light beam.

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              58. The image forming apparatus as claimed in claim 57, wherein said exposure energy of said  
25           light beam is adjusted by changing light intensity of

said light beam.

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59. The image forming apparatus as claimed in claim 57, wherein said exposure energy of said light beam is adjusted by changing time in which said light beam is radiated.

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60. The image forming apparatus as claimed 15 in claim 56, wherein said image forming condition is adjusted by changing bias voltage applied to said means for developing said latent monochrome image.

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61. The image forming apparatus as claimed in claim 56, wherein said image forming condition is adjusted by changing bias voltage applied to said 25 means for transferring said developed monochrome

image.

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62. The image forming apparatus as claimed in claim 56, wherein

said means for developing said latent monochrome image make said formed latent monochrome 10 image visible with toner; and

said image forming condition is adjusted by changing the amount of toner to be used to make said formed latent monochrome image visible.

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63. The image forming apparatus as claimed in claim 62, wherein if the amount of remaining toner 20 is lower than a predetermined level, said amount of toner to be used to make said formed latent monochrome image visible is changed.

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64. The image forming apparatus as claimed in claim 56, wherein said image forming condition is adjusted by changing scan speed at which said light beam scans said means for retaining said latent 5 monochrome image.

10 65. The image forming apparatus as claimed in claim 56, wherein said image forming condition is adjusted by changing at least two of exposure energy of said light beam, bias voltage of said means for developing said latent monochrome image, bias voltage 15 of said means for transferring said developed monochrome image, toner amount to be used for making said formed latent monochrome image visible, scan speed at which said light beam scans said means for retaining said latent monochrome image, and one of 20 moving speed and rotative speed of said image retaining unit.

66. A method of compensating for image deviation, using an image forming apparatus that forms a color image by superposing a plurality of monochrome images, comprising the steps of:

5           setting an image forming condition with which a prescribed compensation pattern for compensating for said image deviation of each monochrome image is formed;

10          forming said prescribed compensation pattern of each monochrome image using said set image forming condition;

             detecting the position of said formed compensation pattern;

15          adjusting the position at which each monochrome image is formed based on said determined pattern position.

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67. The method as claimed in claim 66, further comprising the step of determining whether said formed compensation pattern is detectable;

             wherein the step of setting said image forming condition, the step of forming said

prescribed compensation pattern of each monochrome image, and the step of detecting said pattern position are repeated until said formed compensation pattern is determined to be detectible before said 5 image position is adjusted.

10 68. The method as claimed in claim 67, wherein said image forming condition is set by adjusting exposure energy of a light beam.

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69. The method as claimed in claim 68, wherein said exposure energy of said light beam is adjusted by changing light intensity of said light 20 beam.

25 70. The method as claimed in claim 68,

wherein said exposure energy of said light beam is adjusted by changing time in which said light beam is radiated.

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71. The method as claimed in claim 66,  
wherein said image forming condition is set by  
10 changing bias voltage applied to a development unit.

15 72. The method as claimed in claim 66,  
wherein said image forming condition is set by  
changing bias voltage applied to a transfer unit.

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73. The method as claimed in claim 66,  
wherein said compensation pattern is made visible  
from a latent pattern with toner; and  
25 said image forming condition is set by

changing the amount of toner to be used to make said latent pattern visible.

74. The method as claimed in claim 66, wherein, if the amount of remaining toner is lower 5 than a predetermined level, the amount of said toner to be used to make said latent pattern visible is changed.

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75. The method as claimed in claim 66, wherein, if the amount of said toner is changed, said toner is stirred before forming said latent pattern.

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76. The method as claimed in claim 66, 20 wherein said image forming condition is adjusted by changing scan speed at which a light beam scans an image to be retained.

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77. The method as claimed in claim 66,  
wherein said image forming condition is adjusted by  
changing moving speed or rotative speed of an image  
retaining unit.

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78. The method as claimed in claim 66,  
10 wherein said image forming condition is adjusted by  
changing at least two of exposure energy by a light  
beam, bias voltage of a development unit, bias  
voltage of a transfer unit, the amount of toner to be  
used for making a formed latent pattern visible, and  
15 scan speed at which a light beam scans an image  
retaining unit.

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79. The method as claimed in claim 66,  
further comprising the step of reading said image  
forming condition with which said prescribed  
compensation pattern is formed, stored in a memory  
25 unit;

wherein said prescribed compensation pattern is formed using said read image forming condition.

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80. The method as claimed in claim 66, wherein said image forming condition with which said compensation pattern is formed is different from 10 another image forming condition with which said plurality of monochrome images are formed.